Can You Imagine . . .

. . . a high-speed train that would cost far less than a magnetically levitated train.

BMDO-FUNDED R&D MAY GET FAST TRAINS BACK ON TRACK

For years, magnetically levitated (maglev) trains fostered high expectations of state and Federal transportation planners, because the trains could reach speeds up to 300 mph. Zipping along new tracks, maglev trains could relieve increasing airport and highway congestion between major cities 200 to 600 miles apart. In 1994, air passengers traveled 170 billion miles more than they did in 1970—an increase of 87 percent. Automobile use overshadows all other transportation modes, growing by over 900 billion passenger-miles in the last 24 years.[1]

However, obtaining rights-of-way to lay new track and laying the track itself may cost tens of millions of dollars per mile, pushing this technology out of reach for cash-starved governments. For example, Florida's Department of Transportation derailed a proposed maglev train to transport tourists from the Orlando International Airport to Walt Disney World Amusement Park in 1994 when the price reached $1 billion.

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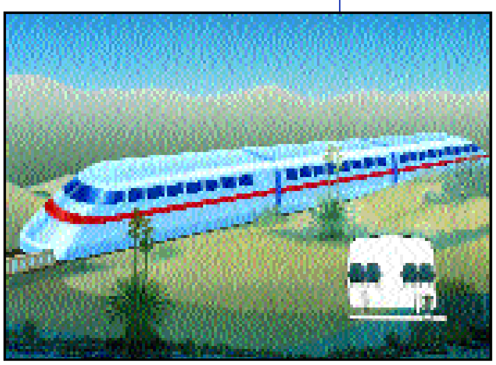
Sandia National Laboratories (Albuquerque, NM) has proposed a new high-speed train that runs on today's rail lines for a fraction of the cost of maglev systems. A segmented-rail phased-induction motor, called Seraphim for short, is the keystone of Sandia's proposal. The motor provides the electromagnetic induction required to propel the new train on conventional wheels and rail. Sandia developed this technology as part of a BMDO electromagnetic "gun" for launching projectiles into space at speeds around one kilometer per second.



■ Pictured above is an artist's concept of Sandia's high-speed train, which could easily reach 300 mph on today's rail lines.

Construction and maintenance costs comprise a large portion of the maglev train's price tag, because it must run on electrified tracks. Sandia projects that its approach, which combines existing track with inexpensive aluminum plates mounted alongside or between the rails, would cost 75 percent less than a maglev system. This approach also allows old-style and new-style trains to travel on the same tracks. In the Seraphim scheme, electromagnets on the locomotive generate accelerating forces between the track plates and the vehicle, pushing the train to 200 mph. With new precision rails, the train could easily reach 300 mph—just as fast as maglev trains.

To test their ideas, the Sandia researchers built and tested a crude model that reached a speed of 34 mph in just 12 feet. To get out of the lab and onto the rails for real-world experiments, Dr. Barry Marder, the physicist heading the project, expects to raise $1 million from private investors and other organizations.

ABOUT THE TECHNOLOGY

In the Seraphim train concept, a segmented aluminum rail mounted alongside or between the rails interacts with powered coils on the train, causing acceleration. Pulsing the current through the coils as they cross the edges of the rail induces surface currents that repel them. The pulse through the coils must occur in synchronization with the relative movement over the rail segments. Sense-and-fire optical circuits, controlling the pulsing of the power modulators, provide this synchronization. The repulsion between the rail segments and magnets propels the train forward. This electromagnetic propulsion technology allows the train to achieve high speeds in relatively short distances. Reversing the phasing of the coil pulsing provides efficient braking.

[1]Lakshmanan, T.R. 1996. Statement of T.R. Lakshmanan, Ph.D., Director, Bureau of Transportation Statistics, Department of Transportation before the Subcommittee on Surface Transportation Committee on Transportation and Infrastructure, U.S. House of Representatives, Washington, DC, 28 March.